

# Line Printer III

Catalog Number 26-1156

**Radio Shack**

**TRS-80  
MICRO  
COMPUTER  
SYSTEM**

**HARDWARE**



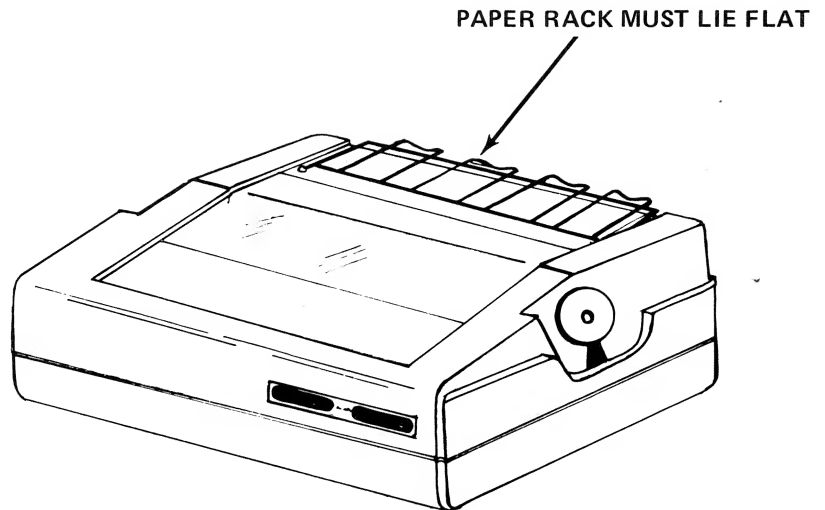
CUSTOM MANUFACTURED FOR RADIO SHACK  A DIVISION OF TANDY CORPORATION

# Line Printer III

## 26-1156

### Important Notices

**Positioning the paper rack:** Be sure the paper lies flat against the rear edge of the Printer. **Do not stand the rack up.**



**Caution about using a source of regulated voltage:** The Printer does not require or need such a source. It should be plugged directly into a 120 VAC 60 Hz electrical outlet. However, if you do use a source of regulated voltage, be sure to turn the source on **before turning on the Printer**. Otherwise, a high-voltage transient from the source could damage the Printer. Also, before turning off the source, first turn off the Printer.

*Thank you*

**Radio Shack**  
**Fort Worth, Texas 76102**

## **Congratulations for selecting this Radio Shack Computer Product!**

The Line Printer III is a high-speed, dot-matrix impact printer.

The Printer includes a parallel interface for connection to the TRS-80 Expansion Interface. A built-in microprocessor controls the Printer and communicates with the TRS-80. Basic operating instructions and self-test routines are resident in read-only memory (ROM).

Other exceptional features include:

- Bidirectional, "logic-seeking" carriage action, for very efficient line-output
- Upper and lower case characters
- Software selectable print densities (5 or 10 characters per inch)
- Up to 132 characters per line
- Software-selectable line densities (6 or 8 lines/inch)
- Tractor-feed mechanism insures perfect paper registration for multi-page printouts, forms, etc.
- Accepts paper widths up to 15"
- Handles single or multi-part forms (up to 5 parts)
- Paper Out sensor stops Printer if paper runs out
- ON LINE/OFF LINE Modes
- Manual controls for LINE FEED,  $\Delta$  1/8 LINE,  $\nabla$  1/8 LINE, SELF-TEST, RESET and RESTART

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# SETTING UP

Carefully unpack the Printer. Be sure to locate all papers, connectors, etc. Remove the protection plastic tube from the rear carriage guide. Keep the box and insulation material in case you ever need to transport the Printer.

## Ribbon Replacement

If the ribbon is already installed, simply check to see that it is threaded properly. Compare with Figure 1 below.

If the ribbon cassette is not installed, or if it is necessary to replace the ribbon (fraying or faint printing at all penetration settings), follow these instructions.

1. Set POWER switch to OFF position.
2. Open printer plastic cover, move Penetration Control Lock Lever forward, and move Control Lever fully to right side. (Figure)
3. Ribbon is in cassette which is held down at left and right sides by stopper claws. Remove ribbon cassette by pressing left and right stopper claws inward and lifting up cassette.
4. Tension ribbon on new ribbon cassette by turning knob on cassette in arrow direction.
5. Insert portion of ribbon extending out from cassette into print head ribbon guide and press down cassette until firmly loaded by stopper claws.

**NOTE:** If cassette fails to be locked by stopper claws when pressed down, crossed slot in cassette knob lower end has not fitted into protrusion sticking out from carriage. Do not press down cassette forcibly. Fit by turning cassette knob in arrow direction and pressing down cassette.

6. Manually move carriage to left and right to check that ribbon is fed out properly.
7. Adjust Penetration Control Lever and tighten Penetration Control LOCK lever according to instructions on the next page.

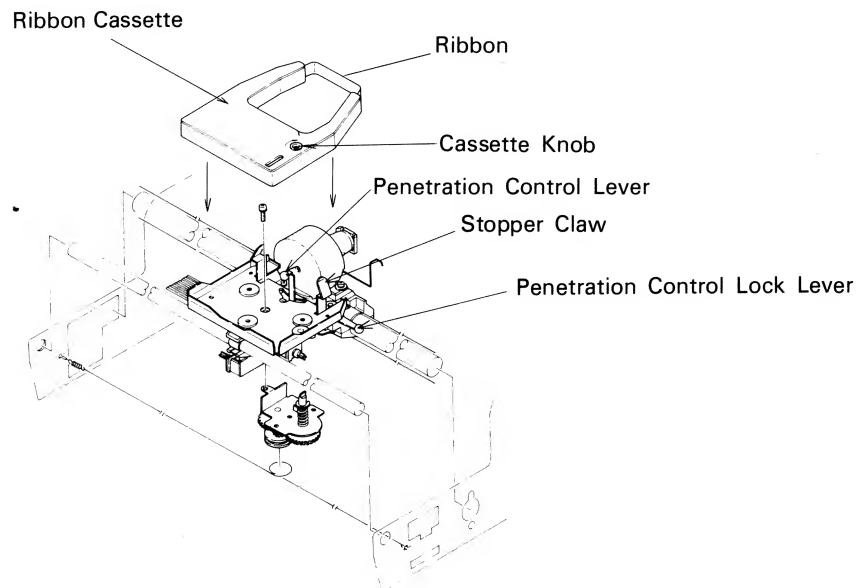


Figure 1

## Paper Loading and Penetration Adjustment

The Printer will accept any standard tractor-feed paper from mailing label strips up to 15" (standard 132-character paper). Paper can be single or multi-part, up to 5 parts total.

Refer to Figures 2, 3 and 4 while following these instructions.

1. Remove the clear plastic cover.
2. Move the Penetration Control LOCK all the way forward, then slide the Penetration Control Lever all the way to the right.
3. Insert paper through paper entry slot on bottom edge of the back of the unit. Slide paper forward into unit until the leading edge protrudes from paper exit slot just below the platen. Grasp the leading edge of paper and pull out about six inches.

**NOTE:** There is another paper-entry slot in the bottom center of the printer. Use this slot if your Printer stand allows paper to enter directly into the bottom of the Printer. This is convenient for loading paper directly out of the paper box.

4. Unsnap and lift the tractor-paper holders. Lay the paper over the tractor sprockets. Align paper holes with the sprockets, and snap paper holders back onto the sprockets with paper in-between.

**NOTE:** To adjust the spacing of the tractor mechanism to fit the paper, loosen the tractor adjustment screw and slide tractor to the correct position. Adjust so that paper is neither stretched tightly nor loose and wrinkled.

5. Adjust the Penetration Control for optimum print quality as follows:

### Single-Part Forms

Slide the Penetration Control all the way to the left for maximum penetration. Then slide Penetration Control LOCK back to lock position.

### Multi-Part Forms

Slide the Penetration Control to the left until there is smudging when you manually move the carriage head back and forth across the paper. Now move the control slightly to the right until there is no smudging when you move the carriage. Slide Penetration LOCK back to lock position.

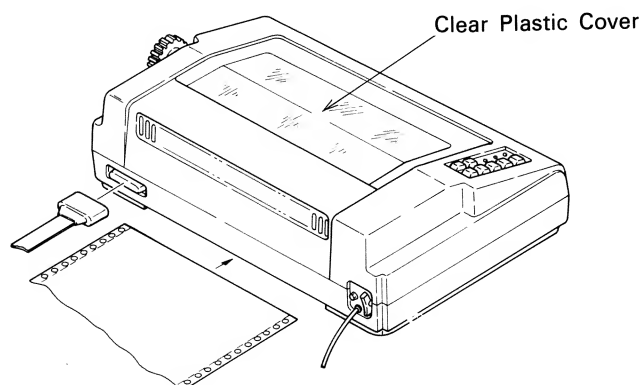


Figure 2

Figure 3

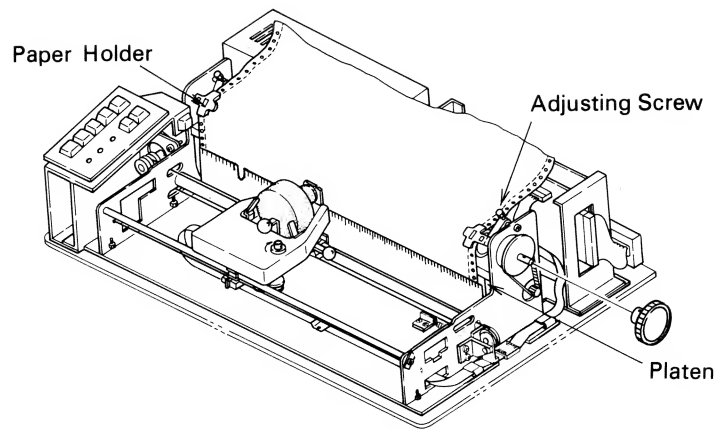
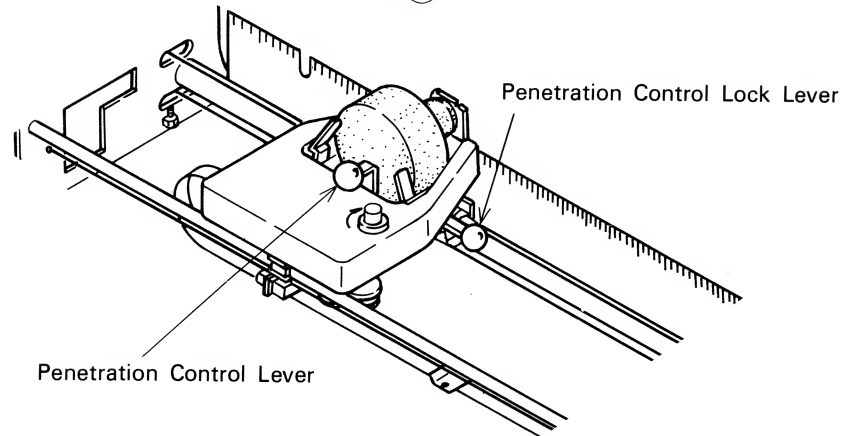


Figure 4



## Connection and Self-Test

Install paper and ribbon before you connect the printer. Leave Printer unplugged. Refer to Figures 5 — 7 while following these instructions.

Plug Printer into appropriate AC outlet. **ALWAYS USE A 3-WIRE GROUNDED OUTLET.**

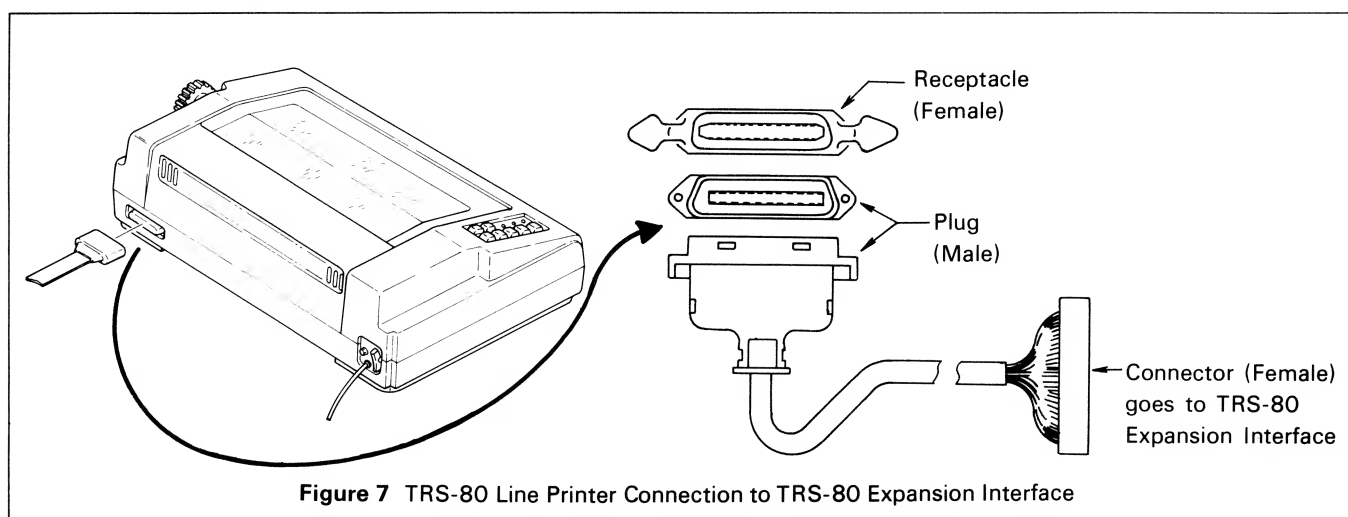
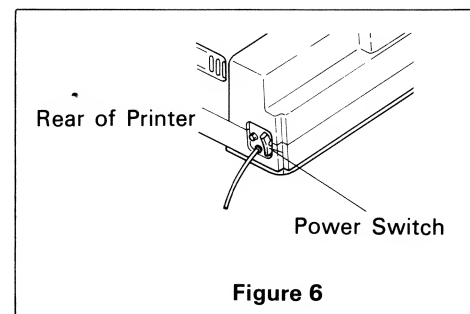
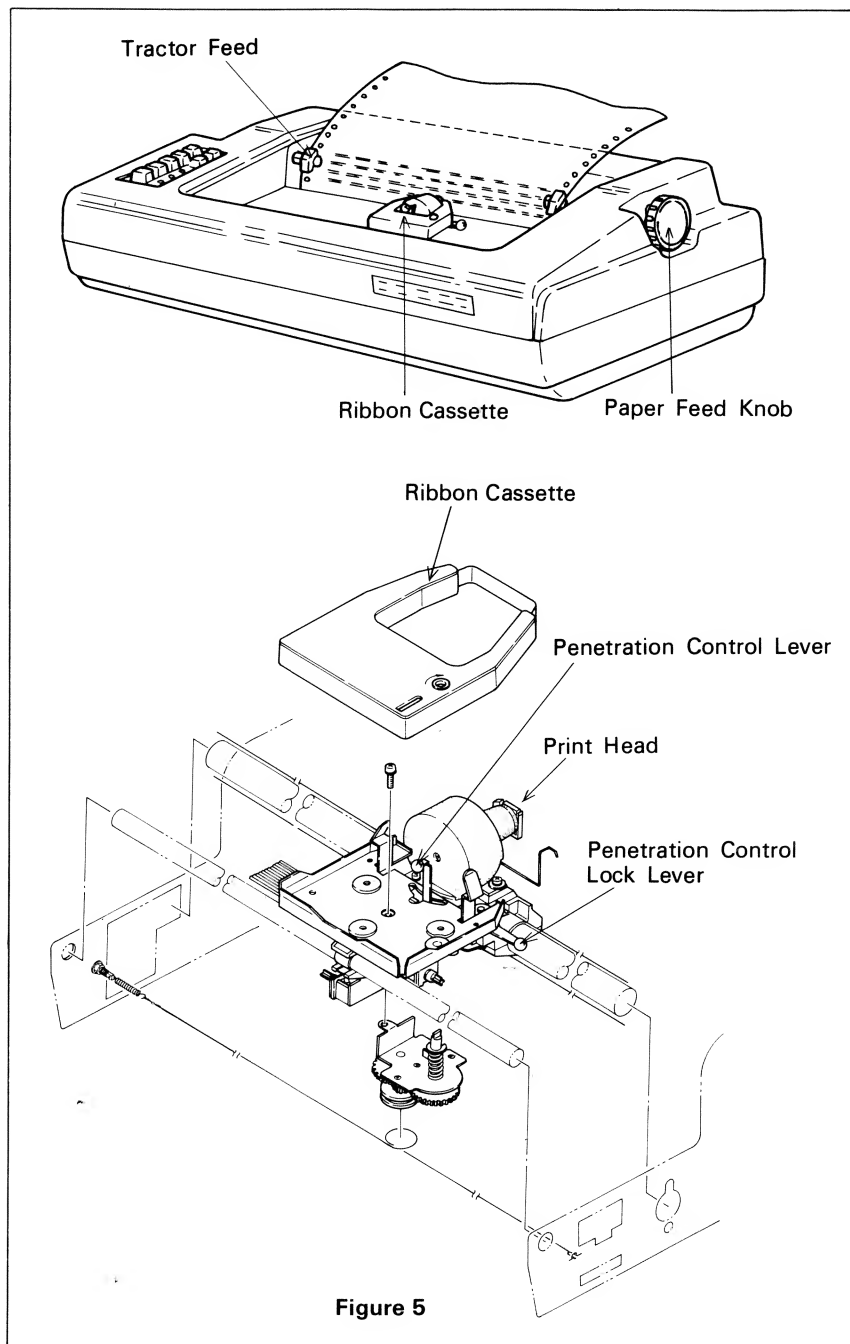
Before connecting the Printer to the output device (e.g., TRS-80 Expansion Interface), perform the Printer Self-Test, as follows:

1. Turn the Printer on. The power switch is located on the bottom rear of the unit, to the next to the power cord.

**NOTE:** Do not perform the following Self-Test unless the Printer is loaded with 15" paper. Otherwise characters will be printed on the platen. This will wear out the print head.

2. Press the SELF-TEST button. The Printer should produce a full-line (132 characters). Press the button again; the Printer will print out another line, and the carriage will return to its home position.
3. If the test characters are printed too close to the left margin (or perhaps are exceeding the margin), adjust the paper position by loosening both tractor mechanisms and sliding them to the correct position.
4. If characters are too light, release the Penetration LOCK (move it forward) and adjust Penetration Control toward the left. If characters are too dark, or are smudged, release LOCK and adjust Penetration Control toward the right. After making this adjustment, re-tighten the Penetration LOCK.
5. Turn off Printer and Computer, and you are ready to connect them.
6. Locate the twisted wire cable. Note that one end has a molded male plug. Connect this end to the jack on the back of the Printer. The plug is asymmetrical. If it won't go on one way, turn it over and try again.
7. Connect the other end of the cable to the TRS-80 Expansion Interface Line Printer Card Edge. The cable must exit from the **bottom** of the card-edge connector.

The Printer is now ready for operation. See Operation.



# OPERATION

## Power-On/Off

First turn on the Printer, then the Computer (Expansion Interface, TRS-80, etc.). The POWER LED will remain lit while the Printer is on.

The Computer will not operate normally with the Printer turned off. So, even if you aren't going to use the Printer, leave it on while you use the Computer.

## Controls and Indicators

### OFF-LINE Controls

The Printer powers-up in an OFF-LINE state. This means it will not accept data from the Computer. There are several useful manual controls for OFF-LINE operation only.

- SELF-TEST ..... Press this key and Printer will produce a full line of characters. This is useful for checking ribbon condition and print quality. Do not use SELF-TEST switch unless the Printer is loaded with 15" paper.
- LINE FEED ..... Press this key and Printer will advance paper one line. Hold down the key for a few seconds and Printer will start continuous line-feeds.
- △ 1/8 LINE ..... Press to advance paper by 1/48" (1/8 line).
- ▽ 1/8 LINE ..... Press to retract paper by 1/48" (1/8 line).
- RESTART ..... When Printer has stopped due to Out-of-Paper condition, replace paper and press RESTART to continue printing without loss of data. RESTART will not work until you have replaced paper.
- ON LINE ..... Press this key to put Printer in ON LINE condition. The READY LED will come on, and the Printer will be ready to accept data from the Computer.

### ON-LINE Controls

Only one of the keys is active while the Printer is ON LINE.

- OFF LINE ..... Press this key to return the Printer to OFF LINE. If Printer is in a print cycle, it will complete the line before stopping. If there is data in the holding buffer, it will remain there until you reset the Printer or return to ON LINE condition.



## Additional Controls and Indicators

Control/Indicator	Location	Function
RESET SWITCH	Left side of carriage compartment	Initializes Printer. Use instead of ON/OFF switch if Printer should ever "hang up". Data in buffer will be lost.
POWER switch	Left rear of Printer	Turns Printer On and Off. Do not turn off while Computer is in use.
Paper out switch	Between 1 and 2 on the paper scale	Tells Printer when paper has run out — when activated, ALERT comes on and Printer goes OFF-LINE.
READY LED	Next to ON-LINE switch	Indicates Printer is ON LINE.
ALERT LED	Next to RESTART switch	Indicates paper empty or carriage fault.
POWER LED	Next to SELF-TEST switch	Indicates Printer is on.

## Received Control Codes

According to the American Standard Code for Information Interchange (ASCII), there are 32 control codes in addition to the codes for the printable characters. (Control codes are sent as data, but the receiving device interprets them as abbreviated instructions, communications-status messages, etc.)

The Line Printer III recognizes six control codes, and ignores all other codes.

Code			Function
Decimal	Octal	Hex	
10	012	0A	Line feed. Prints out current-buffer contents and advances paper one line.
13	015	0D	Carriage return. Prints buffer; next character will print at start of line. With auto linefeed enable, paper advances one line.
27, 54	033, 066	1B, 36	When these two codes are received in sequence, sets line density to six lines/inch. (This is the initial line density.)
27, 56	033, 070	1B, 38	When these two codes are received in sequence, sets line density to eight lines/inch.
30	036	1E	Switches print density to 132 characters/line. (This is the initial print density.)
31	037	1F	Switches print density to 66 characters/line. All subsequent characters are printed double-width. Printer will automatically "wrap-around" to beginning of next line when line is filled.

# Printable Characters

The Line Printer III can produce all ASCII characters from hex 20 through hex 7F (decimal 32 through 127). Here's what they look like:

Code			Char.	Code			Char.	Code			Char.
Dec.	Hex	Oct.		Dec.	Hex	Oct.		Dec.	Hex	Oct.	
32	20	40	(Blank)	64	40	100	@	96	60	140	`
33	21	41	!	65	41	101	A	97	61	141	a
34	22	42	"	66	42	102	B	98	62	142	b
35	23	43	#	67	43	103	C	99	63	143	c
36	24	44	\$	68	44	104	D	100	64	144	d
37	25	45	%	69	45	105	E	101	65	145	e
38	26	46	&	70	46	106	F	102	66	146	f
39	27	47	'	71	47	107	G	103	67	147	g
40	28	50	(	72	48	110	H	104	68	150	h
41	29	51	)	73	49	111	I	105	69	151	i
42	2A	52	*	74	4A	112	J	106	6A	152	j
43	2B	53	+	75	4B	113	K	107	6B	153	k
44	2C	54	,	76	4C	114	L	108	6C	154	l
45	2D	55	—	77	4D	115	M	109	6D	155	m
46	2E	56	.	78	4E	116	N	110	6E	156	n
47	2F	57	/	79	4F	117	O	111	6F	157	o
48	30	60	0	80	50	120	P	112	70	160	p
49	31	61	1	81	51	121	Q	113	71	161	q
50	32	62	2	82	52	122	R	114	72	162	r
51	33	63	3	83	53	123	S	115	73	163	s
52	34	64	4	84	54	124	T	116	74	164	t
53	35	65	5	85	55	125	U	117	75	165	u
54	36	66	6	86	56	126	V	118	76	166	v
55	37	67	7	87	57	127	W	119	77	167	w
56	38	70	8	88	58	130	X	120	78	170	x
57	39	71	9	89	59	131	Y	121	79	171	y
58	3A	72	:	90	5A	132	Z	122	7A	172	z
59	3B	73	;	91	5B	133	↑	123	7B	173	{
60	3C	74	<	92	5C	134	↓	124	7C	174	
61	3D	75	=	93	5D	135	←	125	7D	175	}
62	3E	76	>	94	5E	136	→	126	7E	176	~
63	3F	77	?	95	5F	137	—	127	7F	177	(Blank)

## Details of Printer Operation

The Printer starts a Print cycle under any of the following conditions:

- The data buffer receives the 132nd character (each double width character counts for two).
- There is at least one character in the buffer and a carriage-return/line feed code is received.
- There is at least one character in the buffer and approximately 300 ms elapses with no new characters received.

During a continuous print cycle, the contents of the buffer is printed, the carriage returns, and the paper automatically advances one line. The next character placed in the buffer will start the next line.

**NOTE:** The auto-linefeed function can be disabled for use with some non-Radio Shack computers which do not expect the printer to perform Auto-linefeed. For further information, contact your closest Radio Shack Computer Center.

## Programming Examples

The BASIC statements LPRINT and LLIST output to the Line Printer. See the LEVEL II BASIC Reference Manual for details of syntax.

### Examples:

LLIST

Lists the resident program to the Printer.

LPRINT "THIS IS A TEST"

Prints the message in quotes and tells the Printer that the next printable character begins a new line.

LPRINT "THIS IS PART OF A LINE "; : LPRINT "THIS IS THE REST"

Prints both messages on the same line (because of the semi-colon). The next printable character received will start a new line.

LPRINT "SMALL " CHR\$ (31) "LARGE " CHR\$ (30) "SMALL AGAIN"

Demonstrates the use of normal and double-size characters on the same line.

LPRINT CHR\$ (27) CHR\$ (56) (or LPRINT CHR\$ (27) "8")

All subsequent lines will be printed with a line at 8 lines/inch.

LPRINT CHR\$ (27) CHR\$ (54) (or LPRINT CHR\$ (27) "6")

All subsequent lines will be printed with at 6 lines/inch.

## Assembly Language Output from a TRS-80

Here's a subroutine to output a single byte to the Line Printer III. Load the data byte in ASCII into the C-register, then call the subroutine. To force a carriage return, load register C with hex 0D.

PRTDVR LD	A, (37E8H)	; STATUS
AND	0FOH	; MASK
CP	30H	; BUSY?
JP	NZ, PRTDVR	; IF YES
LD	A, C	; SEND-IT
LD	(37E8H), A	
RET		; RETURN

## Hints and Tips

1. Always plug printer into a 3-wire grounded receptacle.
2. Ensure that all covers are closed and secured while in operation.
3. Never operate printer without paper; if paper is less than 15" wide, take care not to print lines too long for the paper.
4. Avoid leaning or placing objects on any part of printer. If any object is accidentally dropped in the machine, turn power off and carefully take out the object.
5. Turn off power before adjusting print head, replacing ribbon, or loading paper.
6. Use only lint-free cloth to clean printer surface. Do not use solvents or harsh cleaning agents. Mild detergent solution or desk top cleanser may be used sparingly.

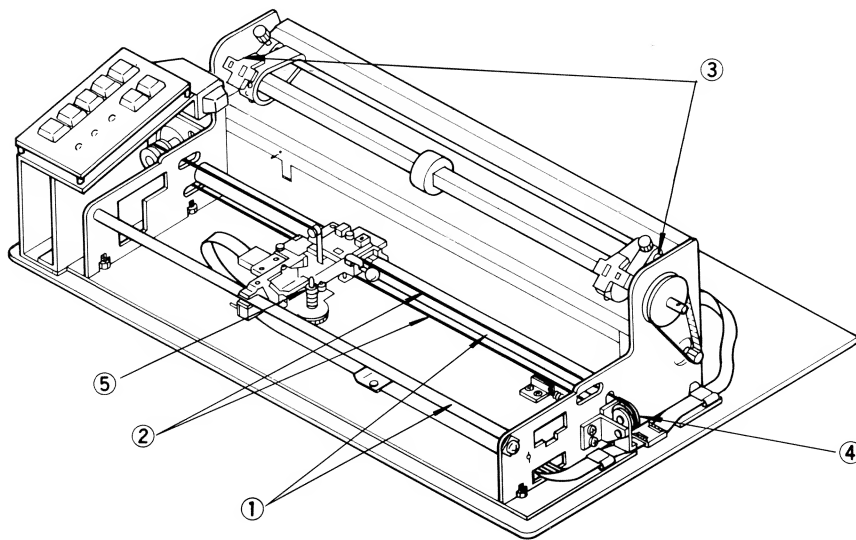
# CARE AND MAINTENANCE

## 1. Caution

- Do not use alcohol when cleaning the cover.
- Never operate Printer when the transparent cover is opened, because it is very dangerous.
- When replacing a fuse, make sure to use the fuse of same type and rating (3A 250V).
- Never place the printer where it is exposed to direct sunlight.
- Place the printer on the strong stand so that the printer may not vibrate during printing.

## 2. Maintenance

- When ribbon or paper chips are stuck to the print head, remove the chips by using a needle like rod.
- A small amount of oil should be applied to the Carrier shaft (1), and Wire (2) every three months. Use high-grade Ester Lubricant compound oil for lubrication. If this is not available, use high-grade sewing machine oil.
- The left and right metals of Paper feed square shaft (3), Shaft of wire pulley (4), and Ribbon cassette drive shaft and gear (5) are lubricated by oil every three months. Use molybdenum disulfide compound for lubrication.



# IF YOU HAVE PROBLEMS . . .

If printer fails to operate properly, try to solve the problem by using this table.

SYMPTOM	ACTION
Printer does not operate when POWER switch is turned ON.	Check power cord extending out from back panel. Check if cord is properly plugged into AC receptacle. Check fuse; if it is blown, replace only with the same type and rating (3A 250V).
Printer stops printing before paper runs out.	Check PAPER EMPTY switch arm to see if bent.
Ink ribbon fails to track properly	Check ribbon to see if loosened from head guide, and if proper clearance is maintained with paper.
Poor print quality (smudging, light print)	Adjust head penetration as described in Penetration Adjustment Section.
ALERT light on and Printer stops	Check paper. Load new paper, if it has run out, and press RESTART. Otherwise, press RESET.

Be sure you check all connections and other possible external sources of error, too. If the Printer Self-Test works okay, some other component in the system may be at fault.

If you can't eliminate the problem, bring the unit to your Radio Shack Computer Center for repair. We'll have it back to you ASAP!

# SPECIFICATIONS

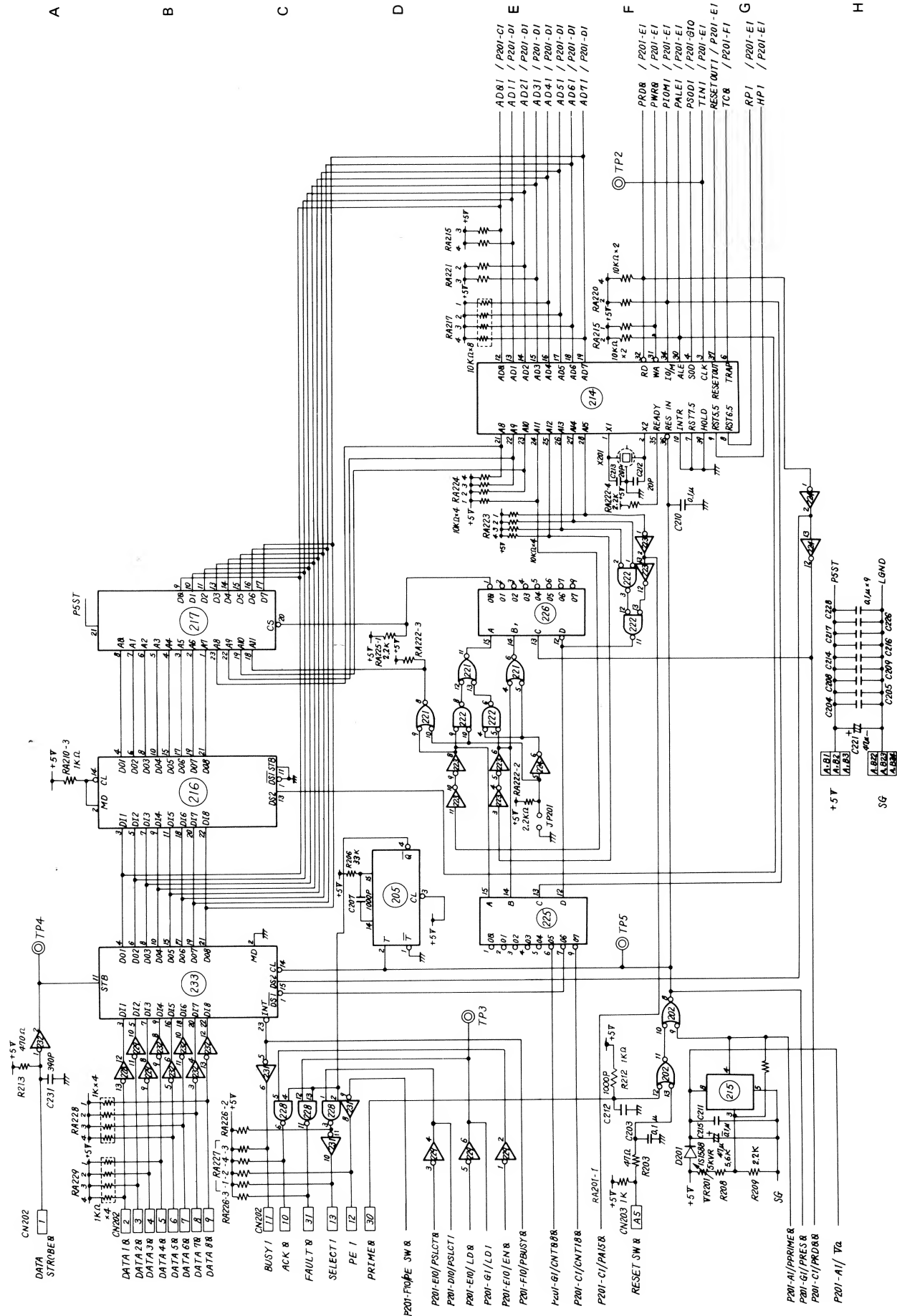
<b>Printing Speed</b> .....	50 lines per minute 120 characters per second
<b>Characters per Line</b> .....	132 maximum
<b>Character Form</b> .....	9 (wide) × 7 (high) dot matrix
<b>Vertical Spacing</b> .....	6 lines or 8 lines per inch (software selectable)
<b>Horizontal Spacing</b> .....	10 or 5 characters per inch (software selectable)
<b>Print Head Life</b> .....	100 million characters
<b>Character Set</b> .....	Modified subset of ASCII, 96 characters or 160 characters (selectable)
<b>Interfaces</b> .....	Expansion interface (26-1140), parallel 8 bit data 4 bit status
<b>Temperature Ranges</b>	
<b>Operating</b> .....	41° to 104°F/5° to +40°C
<b>Storage</b> .....	−40° to 140°F/−40° to +60°C
<b>Paper</b> .....	Continuous business forms with sprocket feed holes in both side 4 ~ 15 inches (ISO/R216) (1) One original paper 40 ~ 60 kg good quality paper (2) Copy paper (1 original + 4 copies) 34 kg non-carbon paper (3) Carbon paper (four parts) 45 kg good quality paper, 38μ carbon paper
<b>Ribbon</b> .....	Radio Shack Catalog Number 26-1414
<b>Size</b> .....	7.7" × 24.4" × 15.9" 19.5 cm × 62.0 cm × 40.5 cm (HWD)
<b>Power Requirements</b> .....	120V AC, 60 Hz, 85W maximum 220/240V AC, 50 Hz for European and Australian models

A	B	C	D	E	F	G	H
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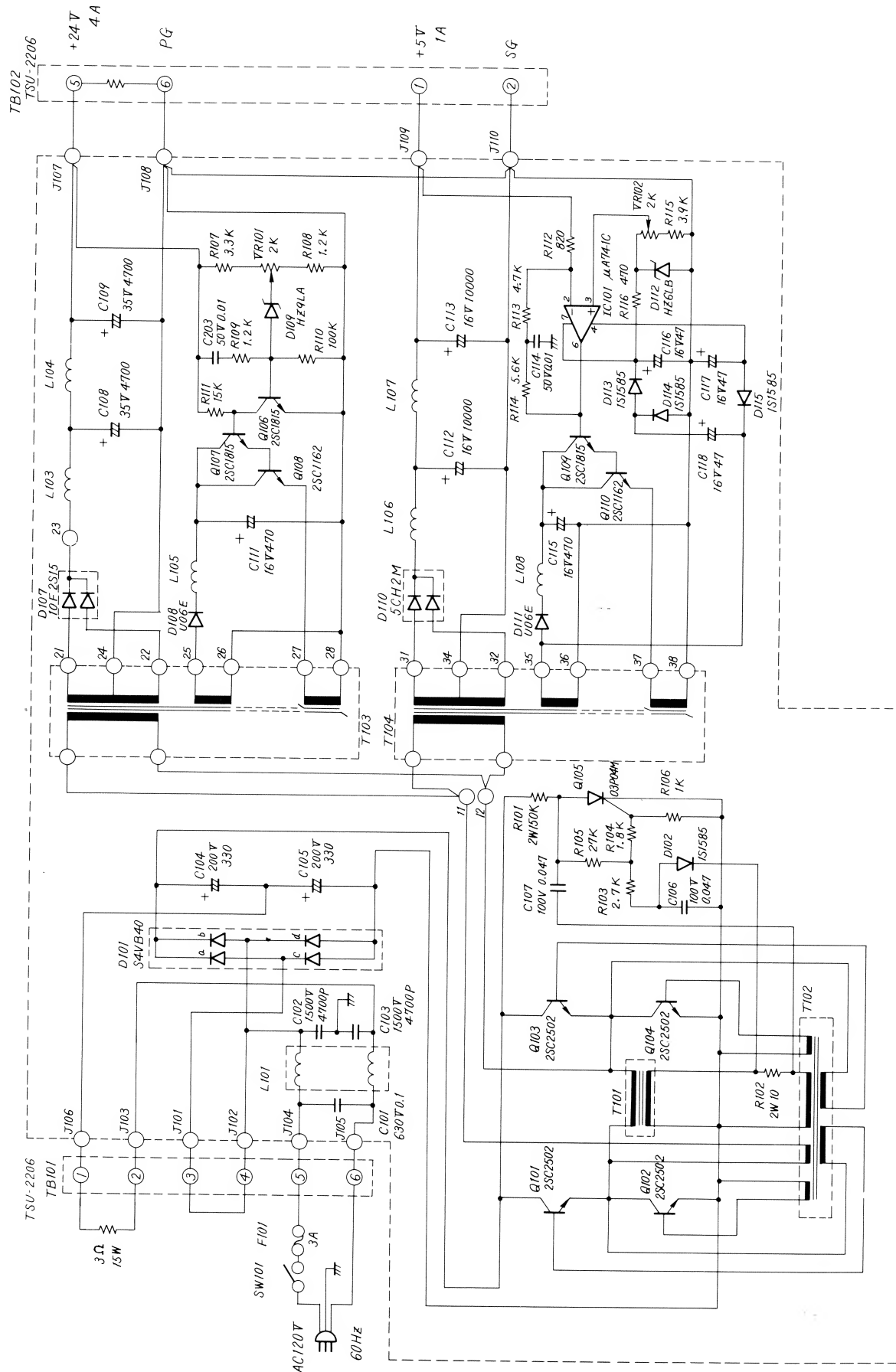




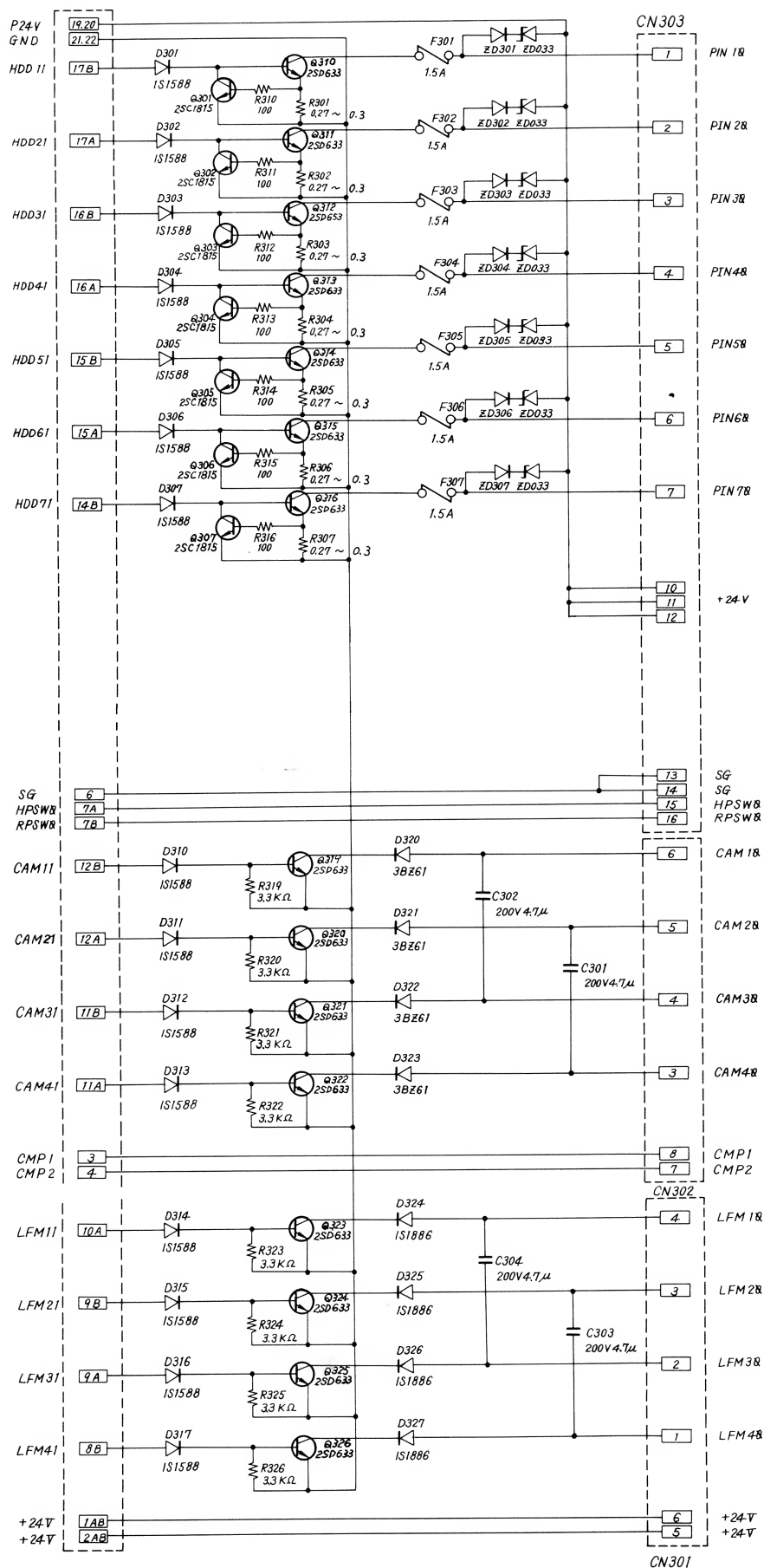
# CONTROLLER LOGIC DIAGRAM 2/2



## POWER SUPPLY LOGIC DIAGRAM



# DRIVER LOGIC DIAGRAM



[illegible]



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